04-10-01

FORM PTO-1390 (REV. 11-2000) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: 0553.0012

U.S. APPLICATION NO (If known, see 37 CFR 1.5): 09/807262

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/US00/06205	3 September 2000	3 September 1999

TITLE OF INVENTION: APPLICATION OF TEXTURED OR PATTERNED SURFACES

APPLICANT(S) FOR DO/EO/US: Eisinger, Lee

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [ ] This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. [ ] The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [ ] is attached hereto (required only if not communicated by the International Bureau).
   b. [ ] has been communicated by the International Bureau.
   c. [X] is not required, as the application was filed in the United States Receiving Office (RO/US).
6. [ ] An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. [ ] is attached hereto.
   b. [ ] has been previously submitted under 35 U.S.C. 154(d)(4).
7. [X] Amendments to the claims of the International Aplication under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [ ] are attached hereto (required only if not communicated by the International Bureau).
   b. [ ] have been communicated by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [X] have not been made and will not be made.
8. [ ] An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. [ ] An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. [ ] An English lanugage translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. [ ] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. [ ] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. [ ] A FIRST preliminary amendment.
14. [ ] A SECOND or SUBSEQUENT preliminary amendment.
15. [ ] A substitute specification.
16. [ ] A change of power of attorney and/or address letter.
17. [ ] A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. [ ] A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. [ ] A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. [ ] Other items or information:

U.S. APPLICATION NO (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
09/807262	PCT/US00/06205	0553.0012

21. [X] The following fees are submitted:	CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO **$1000.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO **$860.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO **$710.00**		
International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) **$690.00**		
International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) **$100.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 860.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	$	
Total claims	7 - 20 =	0	x **$18.00**	$ 0.00	
Independent claims	1 - 3 =	0	x **$80.00**	$ 0.00	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ **$270.00**	$ 0.00	
TOTAL OF ABOVE CALCULATIONS =				$ 860.00	
[ ] Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.			+	$	
SUBTOTAL =				$860.00	
Processing fee of **$130.00** for furnishing the English translation later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				$	
TOTAL NATIONAL FEE =				$ 860.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +				$	
TOTAL FEES ENCLOSED =				$ 860.00	
				Amount to be refunded:	$
				charged:	$

a. [X] A check in the amount of $ 860.00 to cover the above fees is enclosed.

b. [ ] Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. [X] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 05-0875. A duplicate copy of this sheet is enclosed.

d. [ ] Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO.

John M. Skeriotis
One Cascade Plaza - Fourteenth Floor
Akron, Ohio 44308

SIGNATURE

John M. Skeriotis
NAME

43,129
REGISTRATION NUMBER

APPLICATION OF TEXTURED OR PATTERNED SURFACES TO A PROTOTYPE

Background of the Invention

1. Field of Invention

This invention pertains to the art of rapid prototyping technological methods and apparatuses for producing an end product that is an exact model of a 3-dimensional drawing, and more specifically, to methods and apparatuses for applying a texture or pattern to the surface of a prototype part.

2. Description of the Related Art

The need for rapid prototyping is known in the art in order to reduce design iterations, production, and tooling costs. One process used to quickly produce prototype parts is called stereolithography, or SLA. While there are various manufacturers of the equipment used to produce the same type of product, the resulting item is generally referred to as a SLA part or model. The term prototype parts refers to a part to be used for display or sample purposes. The process used to manufacture this prototype part is not germane to this application.

Stereolithography is a 3-dimensional printing process that produces a solid plastic model. The process involves automating a laser to draw or print cross sections of the model onto the surface of photo-curable liquid plastic.

Stereolithography creates a tangible 3-dimensional object from a computer aided drawing (CAD) by directing ultraviolet laser radiation onto a vat of polymer resin, liquid plastic. Using a stereolithography apparatus (SLA), the CAD model data is sliced by proprietary software into to very thin cross sections. The laser generates a small intense spot of ultraviolet (UV) light, which is moved across the top of a vat of liquid photopolymer into a solid where it touches, precisely printing each cross-section. A vertical elevator system lowers the newly formed layer while a leveling system establishes the thickness of the next layer.

Successive cross-sections, each of which adheres to the one below it, are built one layer on top of another to form the part from the bottom up. After the last layer is made, the part is removed from the SLA and flooded with high intensity UV light to complete the polymerization process. In the art, the surface of the part is then

finished by various methods including sanding, sandblasting, painting, or dyeing. Also, each piece can be hand-polished and finished to specifications.

Rapid prototyping is useful in order to turn an idea into a prototype within a matter of hours thereby allowing one to find errors, make design improvements, and analyze an end product without impacting the time-to-market. However, prototypes made by these known processes do not include the fine detailed surface finishing of an actual product.

In the field of microlithography, photo resist compositions are used in processes for making miniaturized electronic components such as computer chips and integrated circuits. In these types of processes, a thin coating of a photo resist is applied to a silicon substrate. Portions of the substrate are masked or otherwise prevented from exposure to a radiation source, such as visible light, ultraviolet light, electron beams, or X-rays. The photo resist on the exposed portions are chemically altered to become either more (positive-working) or less (negative-working) soluble in a developing solution. In either case, portions of the photo resist coating are removed after exposure to provide an altered substrate surface.

The present invention contemplates a new method for applying a texture or pattern to the surface of a prototype part using a photo resist composition. The improved method is simple in design, effective in use, and overcomes the difficulties in the related art while providing better and more advantageous overall results.

Summary of the Invention

In accordance with the present invention, a new and improved method of applying a texture or pattern to the surface of a prototype part is provided which allows the prototype part to be finished to specifications and providing an exact replica of an actual product.

The present invention discloses a method to apply texture or pattern to a surface of a prototype part and will be discussed herein with respect to a prototype part formed by stereolithography as discussed above. However, the method of the present invention can be used for any prototype part including, but not limited to, plastic resins, wood, cardboard, metal, etc.

In accordance with one aspect of the invention, a method for providing a raised feature on a surface of a prototype model is provided. The method is characterized by the steps of:

(a) providing a model having at least one surface on which to provide a raised feature;

(b) coating the surface with a photo resist to a predetermined thickness;

(c) providing means for preventing exposure of a first portion of the photo resist to a radiation source while allowing exposure of a second portion of the photo resist wherein the second portion of the photo resist provides the raised feature;

(d) exposing the surface to a radiation source to chemically alter the second portions of the photo resist; and,

(e) removing the first portion of the photo resist from the surface while leaving the raised feature formed by the exposed photo resist on the surface.

According to another aspect of the invention, the step of coating the surface with a photo resist is further characterized by the steps of applying the photo resist in more than one layer.

According to another aspect of the invention, when the photo resist is applied in more than one layer, sufficient drying time between successive layers of the photo resist is required.

According to another aspect of the invention, the surface of the prototype model is cleaned before the step of coating the surface with the photo resist.

According to another aspect of the invention, the method further includes the steps of:

inspecting the raised feature after the step of removing the first portion of the photo resist; and,

repeating steps (b) - (e) to enhance the raised feature.

According to another aspect of the invention, the step of providing a model is characterized by providing a model formed by a stereolithography process.

According to another aspect of the invention, a prototype model is provided which has a raised feature on at least one surface wherein the raised feature is formed by the inventive method.

One advantage of the present invention is that the end product is an exact model of the 3-D drawing giving designers, engineers, manufacturers, sales

managers, marketing directors, and prospective customers the opportunity to handle the new part or product.

Another advantage of the invention is that design iterations can be made quickly and inexpensively, guaranteeing companies the best product possible, in the shortest time possible.

Another advantage of the invention is that the method for rapid prototyping allows one to have a tangible model at the time of quotes which greatly improves the accuracy of the quote.

Still other benefits and advantages of the invention will become apparent to those skilled in the art to which it pertains upon a reading and understanding of the following detailed specification.

Brief Description of the Drawings

The invention may take physical form in certain parts and arrangement of parts, a preferred embodiment of which will be described in detail in this specification and illustrated in the accompanying drawings which form a part hereof and wherein:

Figure 1 is a representation of a book bag;

Figure 2 is a representation of the sole of an athletic shoe;

Figure 3 is a representation of a golf ball;

Figure 4 is a representation of a softball;

Figure 5 is a representation of a planter basket;

Figure 6 is a representation of a tire tread;

Figure 7 is a representation of a pot;

Figure 8 is a representation of an alternative pot;

Figure 9 is a representation of a piece of glassware;

Figure 10 is a representation of a handbag;

Figure 11 is a representation of a paperweight; and,

Figure 12 is a flow chart depicting the steps used in the inventive process.

Description of the Preferred Embodiment

The drawings referred to herein are for purposes of illustrating a preferred embodiment of the invention only and not for purposes of limiting the same.

Figure 1 shows a book bag 10 having a textured surface 12. The cloth pattern 14 on this textured surface 12 can be made on a prototype part by use of the present invention. Figure 2 shows the sole of an athletic shoe 18. The logo 20 on the sole of this athletic shoe 18 may be produced by the current invention. Figure 3 shows a golf ball 26 showing the multitude of dimples 28 within the surface of the golf ball 26. These dimples 28 may be shown on a prototype model by using the method of the present invention. Figure 4 shows a softball 30 showing a thread pattern 32. Again, a pattern such as this may be shown on a prototype model. Figure 5 shows a planter basket 36 made from woven material. A replicate surface could be shown on a prototype model. Figure 6 shows a tread pattern 40. The texture and pattern of this surface is likewise able to be produced by the current invention.

Figure 7 shows a ceramic pot 44 having an ornamental design 46 on its exterior. The ornamental design 46 could be produced on the surface of a prototype model by the current invention. Figure 8 shows an alternative plastic pot 50. The exterior surface 52 of this pot 50 has a rough surface design on it. The current invention may also be used to produce this surface design.

Figure 9 shows a piece of glassware 56 having various designs 58. In making an actual product, the designs 58 would be typically cut or pressed into the glassware 56. By using the present invention, designs could be considered and altered very quickly.

Figure 10 shows a cloth handbag 60 having a fanciful textured design 62 on it which may be produced on a prototype model by the current invention. Finally, Figure 11 shows a paperweight 64. Again, the design for the paperweight may be first produced on a prototype and modified if necessary by using the present invention before incurring the expense and time of actually producing the product.

Figure 12 is directed to a flow chart showing the steps in the inventive process. The method generally includes the following steps. Firstly, a model is provided which has at least one surface on which a textured surface is desired. In the preferred embodiment, the model is formed by the known processes referred to herein as SLA. The desired surface is then coated with a photo resist to a predetermined thickness. The thickness will correspond to the desired height of any raised features formed on the surface. A pre-selected pattern is transferred to the surface and some portions are masked by coating with wax or film, or other means are provided for

preventing exposure of pre-selected portions of the photo resist, while allowing exposure of other portions of the photo resist, to a radiation source. The portions which are allowed to be exposed are those portions which correspond to raised features of the pre-selected pattern. The surface is then exposed to a radiation source in order to chemically alter the exposed portions of the photo resist. The masking material is removed, if necessary, and the surface is treated with a developing medium in order to remove the unexposed photo resist from the surface, leaving behind the raised features formed by the hardened photo resist. At this point, the surface may be inspected for imperfections in the pattern. Application of additional photo resist and repetition of previous steps can enhance the raised features. Also, any softening or rounding of the edges can be accomplished by over coating the entire surface with additional photo resist.

In the preferred embodiment, the photo resist is applied in a series of thin layers, allowing sufficient drying time between successive applications in order to provide better adherence of the photo resist to the surface.

Also in the preferred embodiment, the surface of the prototype model is cleaned before application of the photo resist, again to promote proper adhesion..

One key element of this disclosure is the concept of applying a raised pattern to an SLA model or any other item by using a photo-resist. The preferred prototype model of the present invention is formed by the above-described stereolithography process. However, the method described herein of applying a texture or pattern to the surface is not limited to a stereolithographic part and can also be used on other parts.

Finally, the present invention is not limited by the color of the object being produced. A component of the current invention can also be the application of different colors to the objects produced.

Figures 1-11 as detailed above are given as exemplary only and not by way of limiting the invention. Those skilled in the art will no doubt find may other applications for the methods of the present invention. The stereolithography processes known in the art are not able to produce the surface texturing given as examples above. It will be apparent to those skilled in the art that the above methods may incorporate changes and modifications without departing from the general scope of this invention. It is intended to include all such modifications and alterations in so far as they come within the scope of the appended claims or the equivalents thereof.

What is claimed:

1. A method for providing a raised feature on a surface of a prototype model characterized by the steps of:

(a) providing a model having at least one surface on which to provide a raised feature;

(b) coating the surface with a photo resist to a predetermined thickness;

(c) providing means for preventing exposure of a first portion of the photo resist to a radiation source while allowing exposure of a second portion of the photo resist wherein the second portion of the photo resist provides the raised feature;

(d) exposing the surface to a radiation source to chemically alter the second portions of the photo resist; and,

(e) removing the first portion of the photo resist from the surface while leaving the raised feature formed by the exposed photo resist on the surface.

2. The method of claim 1 wherein the step of coating the surface with a photo resist is further characterized by the steps of applying the photo resist in more than one layer.

3. The method of claim 2 further characterized by the step of:

allowing sufficient drying time between successive layers of the photo resist.

4. The method of claim 1 further characterized by the step of:

cleaning the surface of the prototype model before the step of coating the surface with the photo resist.

5. The method of claim 1 further characterized by the steps of:

inspecting the raised feature after the step of removing the first portion of the photo resist; and,

repeating steps (b) - (e) to enhance the raised feature.

6. The method of claim 1 wherein the step of providing a model is characterized by:

providing a model formed by a stereolithography process.

7. A prototype model having a raised feature on at least one surface wherein the raised feature is formed by the method of claim 1.

1/12

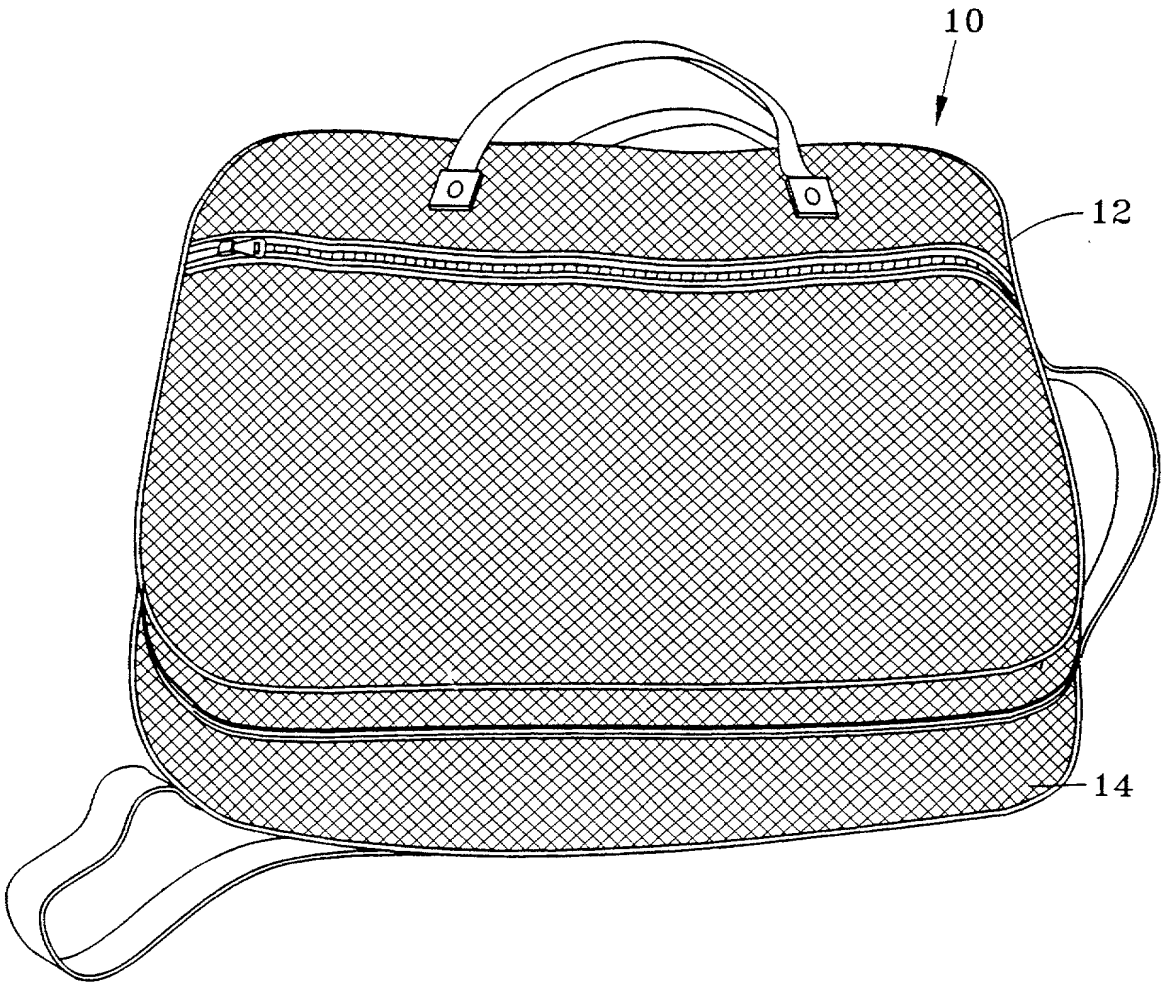


FIG-1

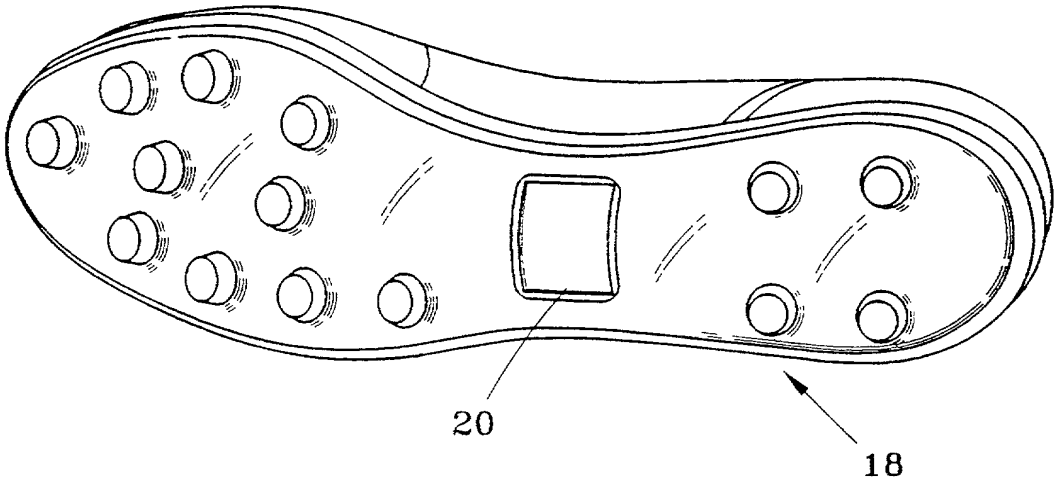


FIG-2

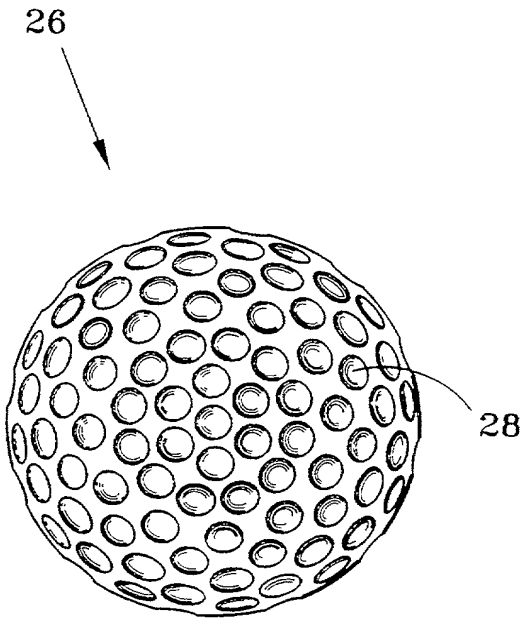


FIG-3

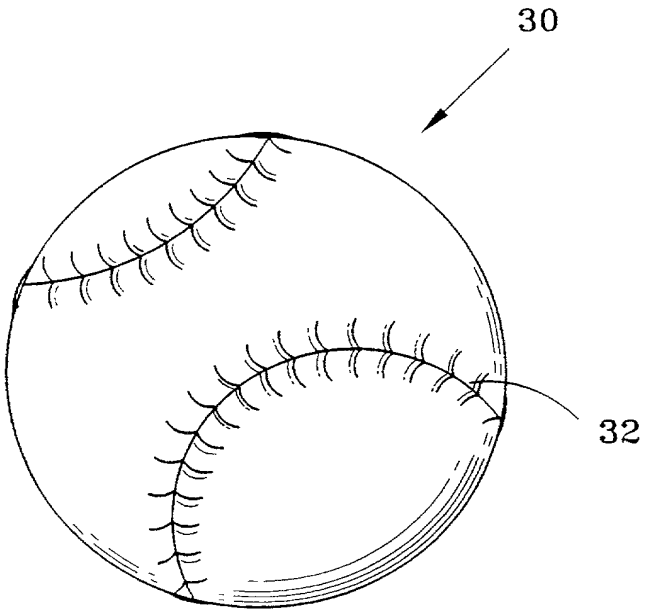


FIG-4

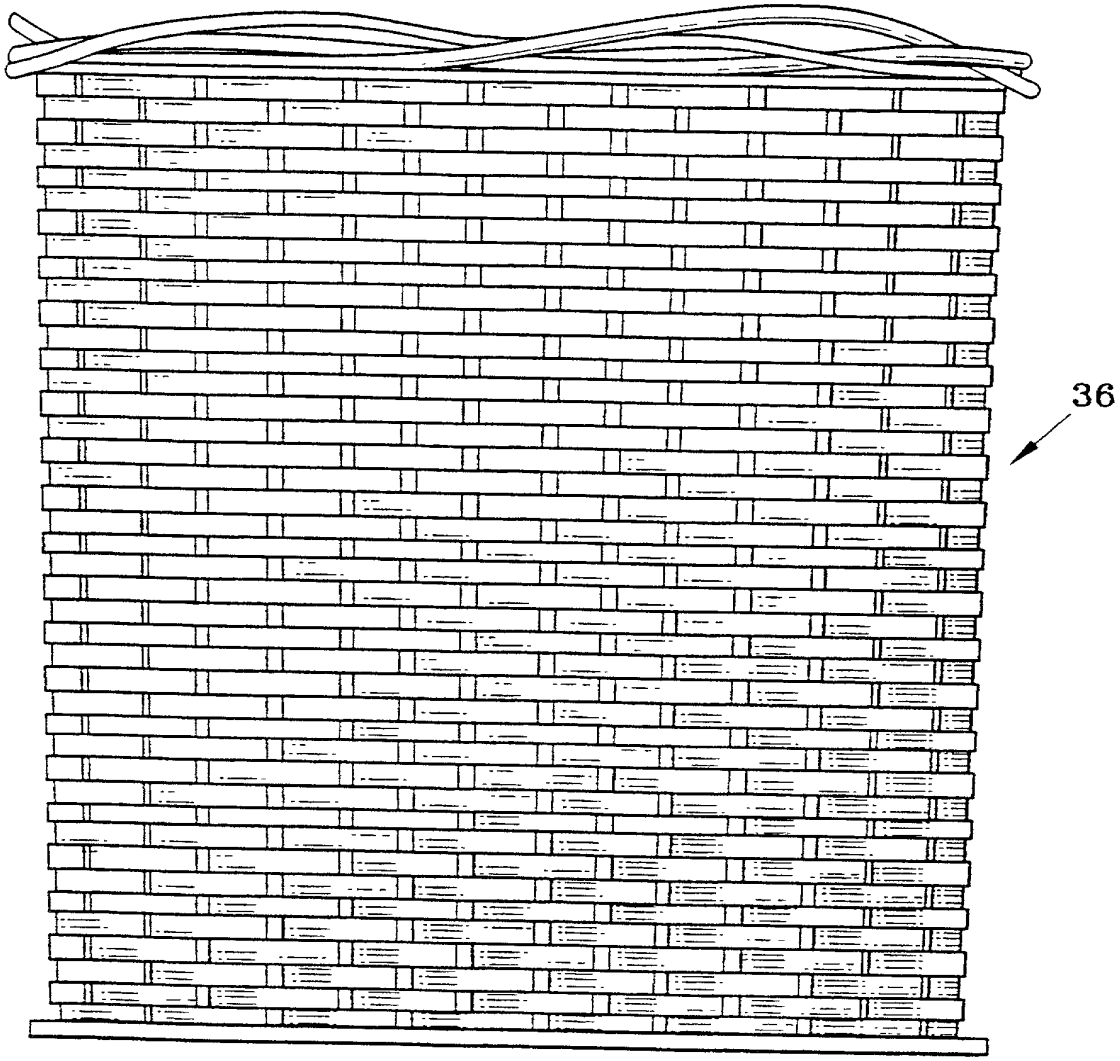


FIG-5

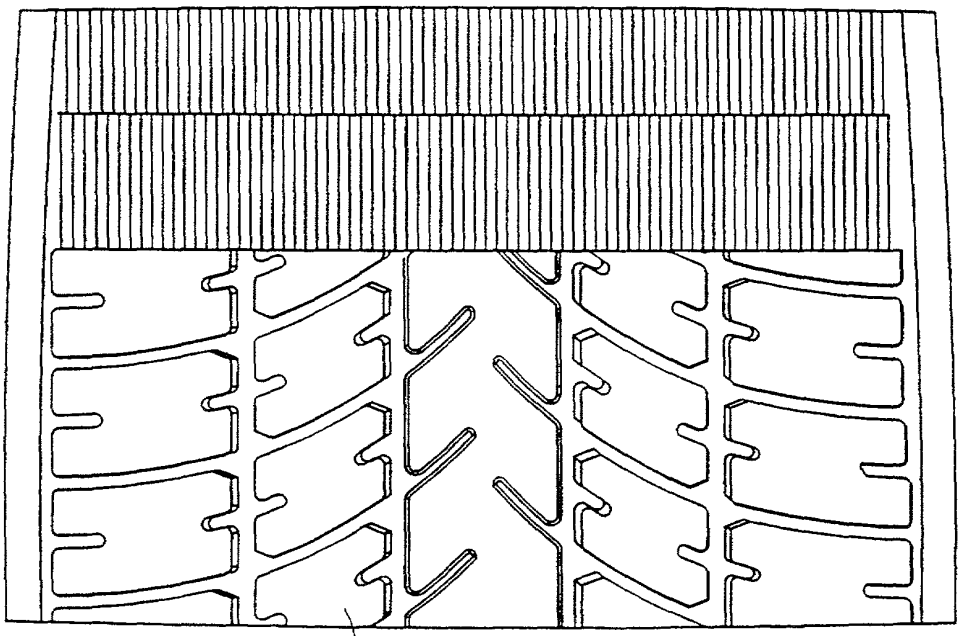
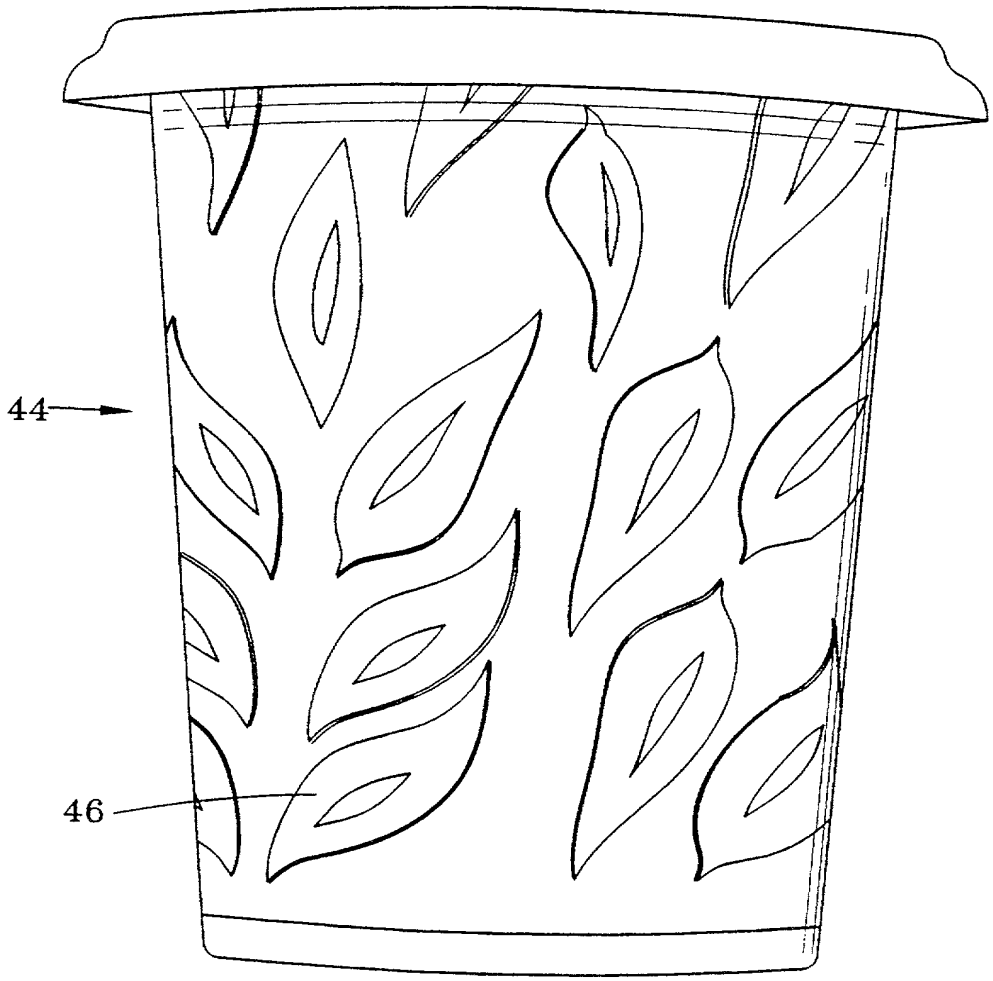


FIG-6



FIG–7

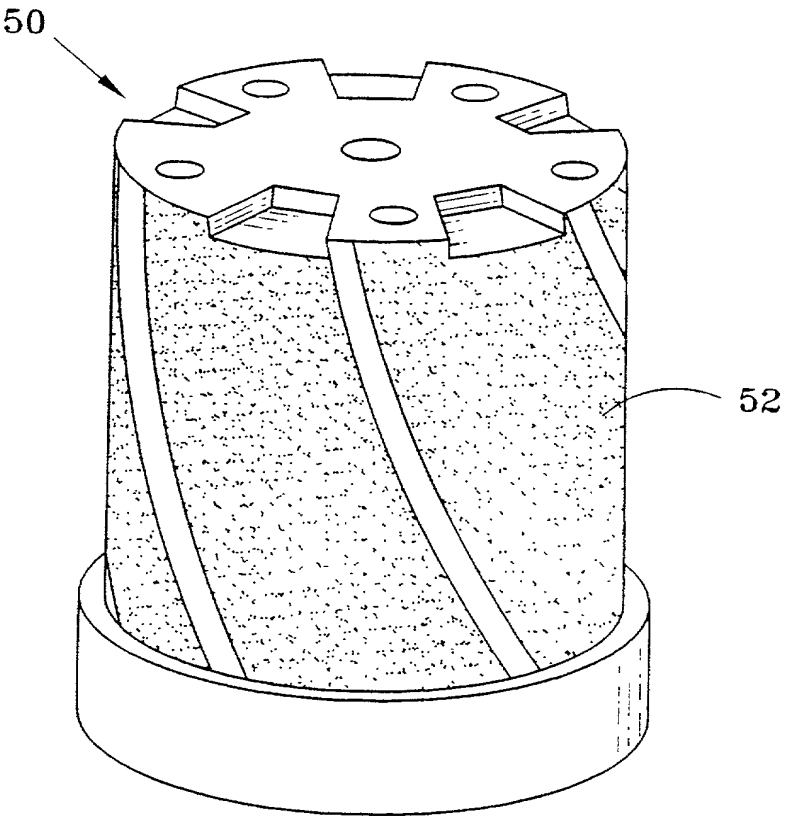


FIG-8

9/12

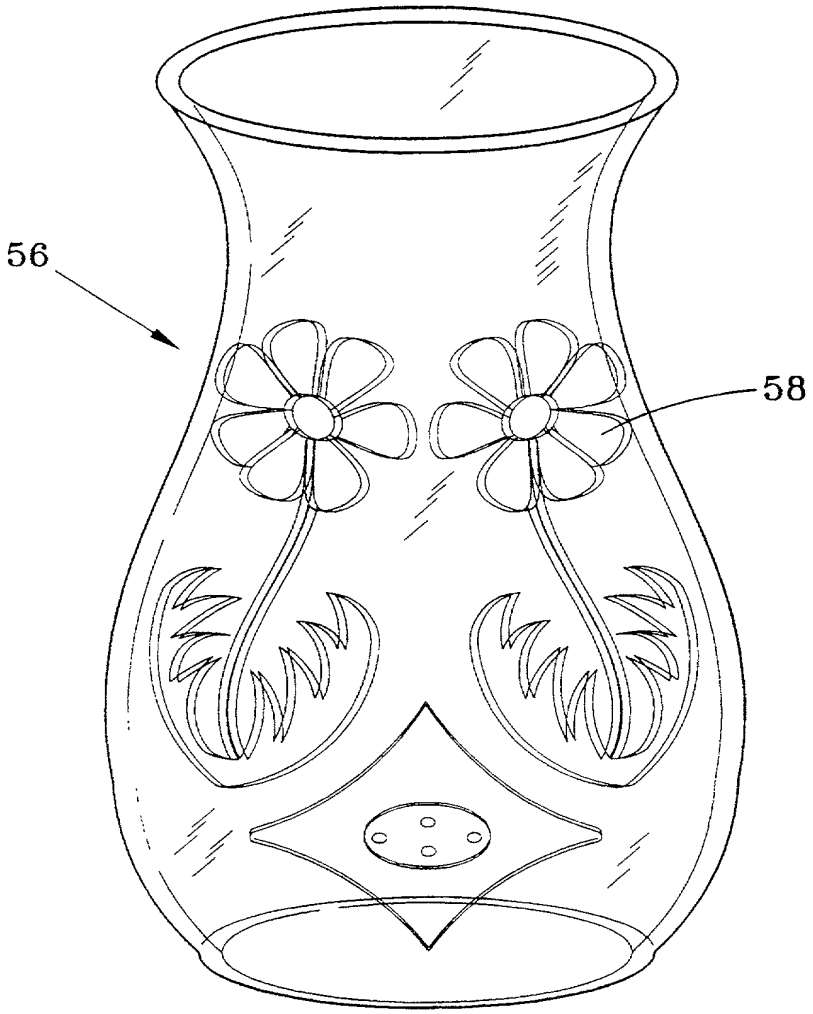


FIG-9

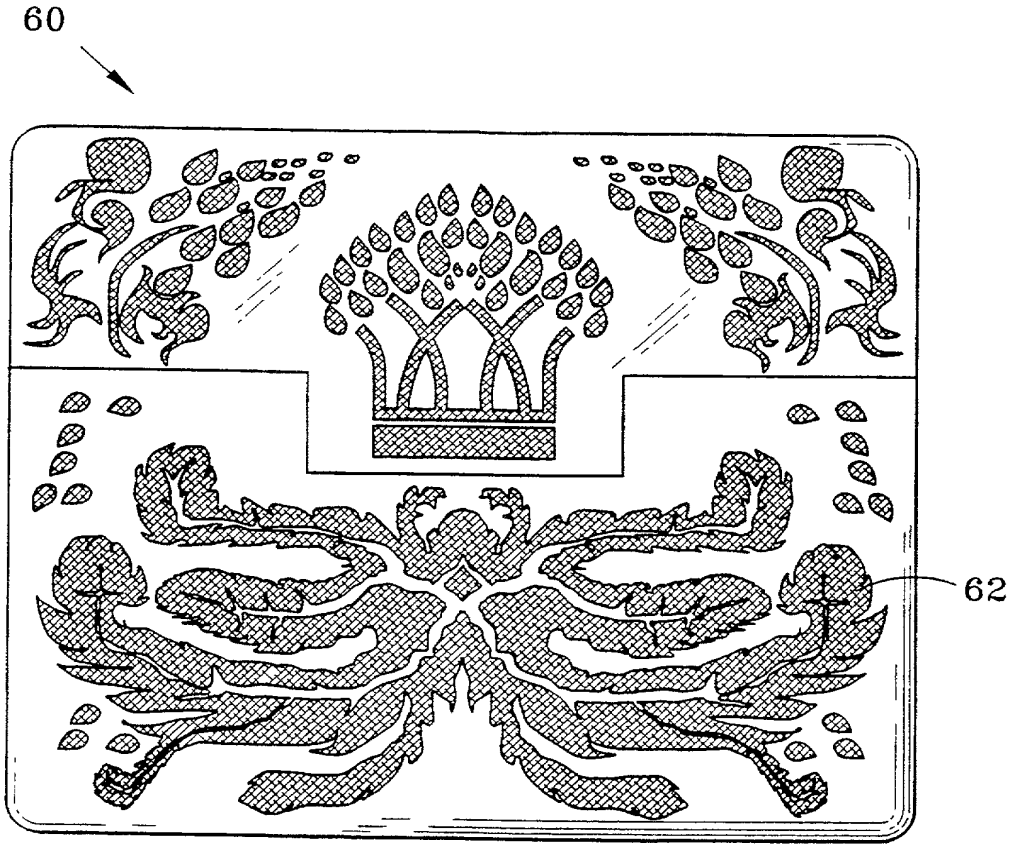


FIG-10

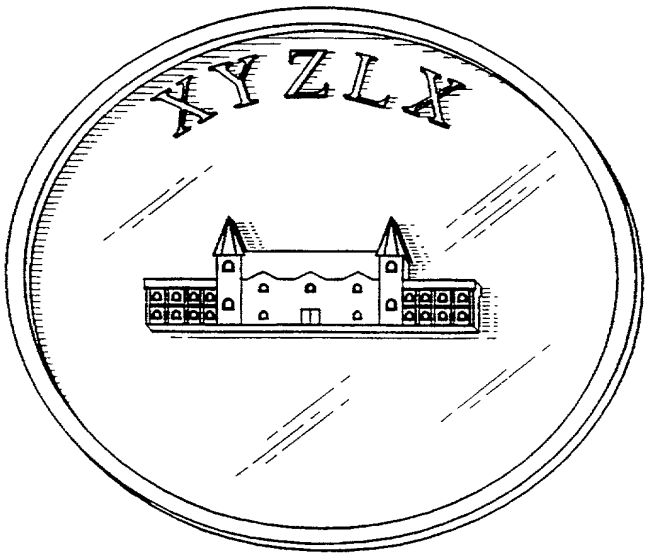
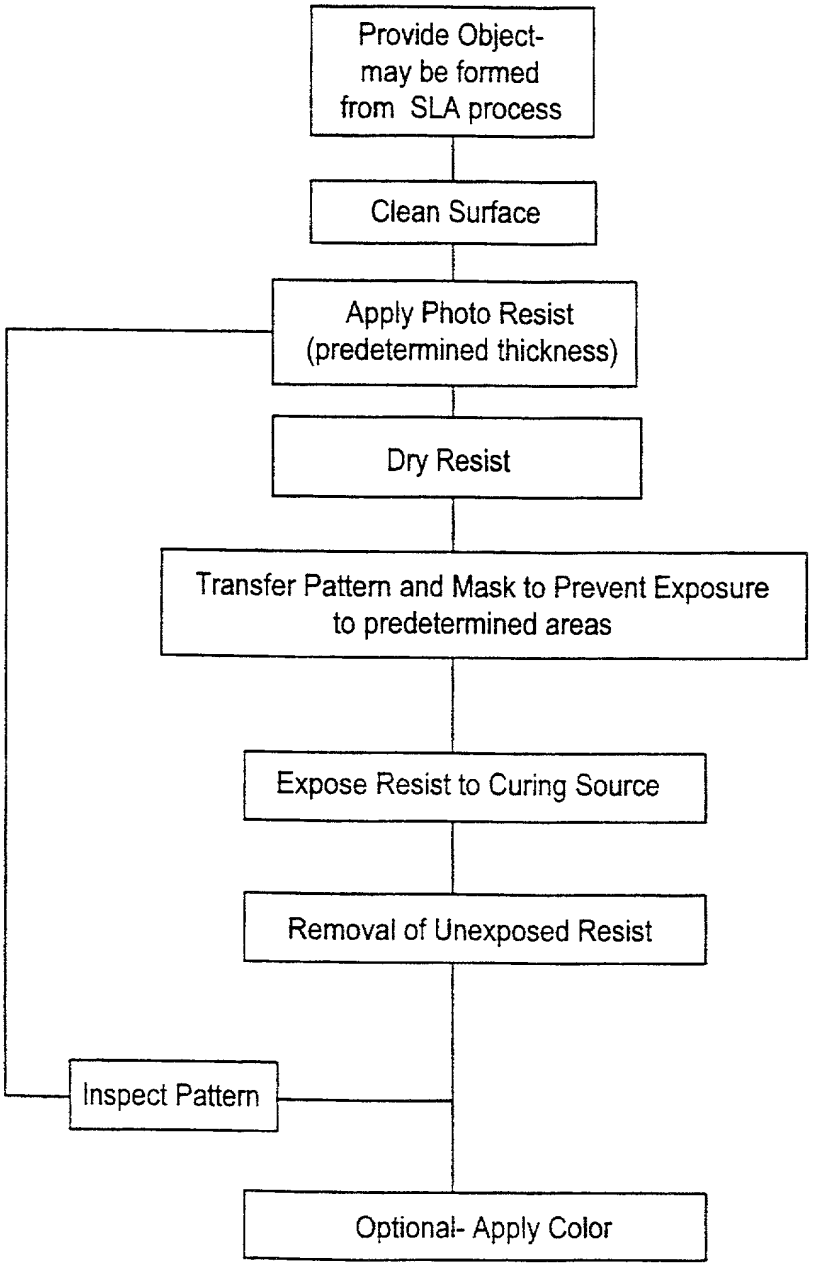


FIG-11

APPLICATION OF TEXTURED
OR PATTERNED SURFACES



FIG–12

Attorney's Docket No. 0553.0012

PATENT

==========

COMBINED DECLARATION AND POWER OF ATTORNEY

(ORIGINAL, DESIGN, NATIONAL STAGE OF PCT, SUPPLEMENTAL, DIVISIONAL, CONTINUATION OR CIP)

==========

As a below named inventor, I hereby declare that:

TYPE OF DECLARATION

This declaration is of the following type: (check one applicable item below)

__X__ original

____ design

____ supplemental

[NOTE: If the declaration is for an International Application being filed as a divisional, continuation or continuation-in-part application do not check next item; check appropriate one of last three items.]

__X__ national stage of PCT

[NOTE: If one of the following 3 items apply then complete and also attach ADDED PAGES FOR DIVISIONAL, CONTINUATION OR CIP.]

____ divisional

____ continuation

____ continuation-in-part (CIP)

INVENTORSHIP IDENTIFICATION

[WARNING: If the inventors are each not the inventors of all the claims an explanation of the facts, including the ownership of all the claims at the time the last claimed invention was made, should be submitted.**]**

My residence, post office address and citizenship are as stated below next to my name, I believe I am the original, first and sole inventor or an original, first and joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled:

TITLE OF INVENTION

APPLICATION OF TEXTURED OR PATTERNED SURFACES

SPECIFICATION IDENTIFICATION

The specification of which: (complete (a), (b) or (c)

(a) ____ is attached hereto.

(b) ____ was filed on _____ as ____ Serial No. 0 /_____

or ____ Express Mail No., as Serial No. not yet known_____ and was amended on _____ (if applicable).

(c) __X__ was described and claimed in PCT International Application No. PCT/US00/06205 filed on 9 March 2000 and as amended under PCT Article 19 on N/A (if any).

[NOTE: Amendments filed after the original papers are deposited with the PTO which contain new matter are not accorded a filing date by being referred to in the declaration. Accordingly, the amendments involved are those filed with the application papers or, in the case of a supplemental declaration, are those amendments claiming matter not encompassed in the original statement of invention or claims. See 37 CFR 1.67.]

ACKNOWLEDGEMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined 37 C.F.R. § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

_____ In compliance with this duty there is attached an information disclosure statement, 37 CFR 1.97.

PRIORITY CLAIM

I hereby claim foreign priority benefits under Title 35, United States Code § 119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

(complete (d) or (e))

(d) ____ no such applications have been filed.

(e) __X__ such applications have been filed as follows.

[NOTE: Where item (c) is entered above and the International Application which designated the U.S. claimed priority check item (e), enter the details below and make the priority claim.]

EARLIEST FOREIGN APPLICATION(S), IF ANY FILED WITHIN 12 MONTHS (6 MONTHS FOR DESIGN) PRIOR TO THIS U.S. APPLICATION

COUNTRY	APPLICATION No.	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 USC 119
PCT	PCT/US00/06205	3 September 2000	_X_ YES ___ NO
			___ YES ___ NO
			___ YES ___ NO
			___ YES ___ NO
			___ YES ___ NO

ALL FOREIGN APPLICATION(S), IF ANY FILED MORE THAN 12 MONTHS (6 MONTHS FOR DESIGN) PRIOR TO THIS U.S. APPLICATION

_____

_____

POWER OF ATTORNEY

As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

John M. Skeriotis

Reg. No. 43,129

(check the following item, if applicable)

____ Attached as part of this declaration and power of attorney is the authorization of the above-named attorney(s) to accept and follow instructions from my representative(s).

SEND CORRESPONDENCE TO
John M. Skeriotis
One Cascade Plaza - Fourteenth Fl.
Akron, OH 44308

DIRECT TELEPHONE CALLS TO:
John M. Skeriotis
(330) 535-9999

DECLARATION

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

SIGNATURE(S)

Full name of sole or first inventor: Lee Eisinger

Inventor's signature [signature]

Date 10/8/01 Country of Citizenship: USA

Residence: 463 Locust Street, Akron, OH 44307 OH

Post Office Address: 463 Locust Street, Akron, OH 44307

Full name of second joint inventor, if any ____________________

Inventor's signature ____________________

1-00

Date _____ Country of Citizenship _____

Residence _____

Post Office Address _____

CHECK PROPER BOX(ES) FOR ANY OF THE FOLLOWING ADDED PAGE(S) WHICH FORM A PART OF THIS DECLARATION

____ Signature for third and subsequent joint inventors. Number of pages added _____

____ Signature by administrator (trix), executor (trix) or legal representative for decreased or incapacitated inventor. Number of pages added_____

____ Signature for inventor who refuses to sign or cannot be reached by person authorized under 37 CFR 1.47. Number of pages added_____

***

_____ Added pages to combined declaration and power of attorney for divisional, continuation, or continuation-in-part (CIP) application.

____ Number of pages added_____

***

____ Authorization of attorney(s) to accept and follow instructions from representative

***

If no further pages form a part of this Declaration then end this Declaration with this page and check the following item

__X__ This declaration ends with this page